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EXAMINER	
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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,208	BUSCEMA, MASSIMO	
	Examiner	Art Unit	
	Peter Coughlan	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *7/14/2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This office action is in response to an AMENDMENT entered December 5, 2006 for the patent application 10/542208 filed on July 14, 2005.

2. The First Office Action of September 15, 2006 is fully incorporated into this Final Office Action by reference.

Status of Claims

3. Claims 1-34 are pending.

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-29 are rejected under 35 U.S.C. 101 for nonstatutory subject matter. The computer system must set forth a practical application of that § 101 judicial exception to produce a real-world result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-

77. The invention is ineligible because it has not been limited to a substantial practical application. Optimizing a database for training and testing purposes has no practical application. The result has to be a practical application. Please see the interim guidelines for examination of patent applications for patent subject matter eligibility published November 22, 2005 in the official gazette.

In determining whether the claim is for a "practical application," the focus is not on whether the steps taken to achieve a particular result are useful, tangible and concrete, but rather that the final result achieved by the claimed invention is "useful, tangible and concrete." If the claim is directed to a practical application of the § 101 judicial exception producing a result tied to the physical world that does not preempt the judicial exception, then the claim meets the statutory requirement of 35 U.S.C. § 101. The invention is to improve a training database of sample records. If said improved training database is not employed is some fashion then it is an exercise only and without practical application.

The invention must be for a practical application and either:

1) specify transforming (physical thing) or

2) have the FINAL RESULT (not the steps) achieve or produce a

useful (specific, substantial, AND credible),

concrete (substantially repeatable/ non-unpredictable), AND

tangible (real world/ non-abstract) result.

A claim that is so broad that it reads on both statutory and non-statutory subject matter, must be amended, and if the specification discloses a practical application but

the claim is broader than the disclosure such that it does not require the practical application, then the claim must be amended.

Claims that recites the improvement of a training database or sample records without a real world application or function are not statutory.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The word 'pseudo-random' is not clearly defined nor an accepted term within the art.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-14, 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lapointe et al, in view of Arouh et al. (U. S. Patent Publication 20030004906, referred to as **Lapointe**; U. S. Patent Publication 20020077756, referred to as **Arouh**)

Claim 1

Lapointe teaches defining a set of one or more distributions of the database records onto respective training and testing subsets(**Lapointe,** ¶0010; 'Distributions' of applicant is equivalent to 'sufficient training data' of Lapointe.); using the defined set of distributions to train and test a first generation set of one or more prediction algorithms and assigning a fitness score to each, each of said prediction algorithms being associated with a certain distribution of said database records. (**Lapointe,** ¶0066; 'Prediction algorithms' of applicant is equivalent to 'neural network' of Lapointe.)

Lapointe does not teach feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each.

Arouh teaches feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each. (**Arouh,** abstract; Arouh illustrates a genetic algorithm to train a neural network. 'Evolutionary algorithm' of applicant is equivalent to 'genetic algorithm' of Arouh. 'Prediction algorithm' of applicant is equivalent to 'neural

network' of Arouh.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Lapointe by using genetic algorithms to modify neural networks as taught by Arouh to have feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each.

For the purpose of using an intelligent algorithm to alter another intelligent algorithm

Lapointe teaches continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs (**Lapointe,** ¶0469; 'Termination' of applicant occurs when the 'desired output would fall in the range of 0.0 to 1.0' of Lapointe.) where said termination event is at least one of a prediction algorithm is generated with a fitness score equal to or exceeding a defined minimum value(**Lapointe,** ¶0469; 'Minimum value' of applicant is equivalent to '0.0' of Lapointe.), the maximum fitness score of successive generational sets of prediction algorithms converging to a given value(**Lapointe,** ¶0469; 'Maximum value' of applicant is equivalent to '1.0' of Lapointe.), and a certain number of generations having been generated (**Lapointe,** ¶0141; Lapointe illustrates if the current training cycle is the final training cycle. A neural network can be 'over trained' resulting in diminished results.) selecting a prediction algorithm having a best fitness score. (**Lapointe,** ¶0033; 'Best fitness score' of applicant is equivalent to 'highest "m" ranked varibles' of Lapointe.)

Lapointe does not teach using the distribution of database records associated with said selected prediction algorithm in performing supervised learning, said

supervised learning including training and testing of prediction algorithms, for application to a predetermined problem.

Arouh teaches using the distribution of database records associated with said selected prediction algorithm in performing supervised learning, said supervised learning including training and testing of prediction algorithms, for application to a predetermined problem. (**Arouh,** ¶0229; 'Distributions of database records' of applicant is equivalent to 'sets of training and testing data' of Arouh.), wherein said method is performed using a computer and computer software forming an intelligent system. (**Arouh,** abstract; Both 'genetic algorithms' and neural networks' are considered being an 'intelligent system'.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Lapointe by using training sets to train with as taught by Arouh to have the distribution of database records associated with said selected prediction algorithm in performing supervised learning, said supervised learning including training and testing of prediction algorithms, for application to a predetermined problem.

For the purpose of training the neural network to be used within a specific domain.

Claim 2

Lapoint does not teach generating a population of prediction algorithms, where each one of said prediction algorithms is trained and tested according to a different

distribution of the records of the data set in the complete database onto a training data set and a testing data set.

Arouh teaches generating a population of prediction algorithms, where each one of said prediction algorithms is trained and tested according to a different distribution of the records of the data set in the complete database onto a training data set and a testing data set. (**Arouh,** ¶0229; 'Distributions of database records' of applicant is equivalent to 'sets of training and testing data' of Arouh.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Lapointe by training a neural network with multiple outputs as taught by Arouh to generating a population of prediction algorithms, where each one of said prediction algorithms is trained and tested according to a different distribution of the records of the data set in the complete database onto a training data set and a testing data set.

For the purpose of having the neural network produce more than one output thus expanding its capabilities.

Lapointe teaches each different distribution being created by a random or pseudo-random distribution (**Lapointe,** ¶0141); each prediction algorithm of the said population is trained according to its own distribution of records of the training set and is validated in a blind way according its own distribution on the testing set (**Lapointe,** ¶0141; 'Validated in a blind way' of applicant is accomplished by using 'random number seeds' of Lapointe.); a score reached by each prediction algorithm is calculated in the testing phase representing its fitness (**Lapointe,** ¶0760); an evolutionary algorithm

being further provided which combines the different models of distribution of the records of the complete data set in a training and in a testing set which sets are represented each one by a corresponding prediction algorithm trained and tested on the basis of the said training and testing data set according to the fitness score calculated in the previous step for the corresponding prediction algorithm(**Lapointe,** ¶0007; 'Combines different models' of applicant is equivalent to 'training data' which is composed training examples' of Lapointe.); the fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets (**Lapointe,** ¶0760); repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a desired value (**Lapointe,** ¶0125 and formula between ¶0125 and ¶0126; 'Finite number of generations' of applicant is illustrated by the values of the double summation symbols; '10' and 's' of Lapointe.); setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm. (**Lapointe,** ¶0012; 'Setting the data records' of applicant is equivalent to 'final diagnosis' of Lapointe.)

Claim 3.

Lapointe teaches that to each record of the data set a distribution variable is associated which is binary and has at least two status, one of this two status being associated with the inclusion of the record in the training set and the other in the testing set. (**Lapointe,** ¶0010; Lapointe illustrates there exists training and testing data.)3

Claim 4

Lapointe teaches the prediction algorithm is an artificial neural network. (**Lapointe,** ¶0006)

Claim 5

Lapointe teaches the prediction algorithm is a classification algorithm. (**Lapointe,** ¶0006)

Claim 6

Lapointe teaches that once an optimum distribution has been computed, the optimised training data subset is made equal to a complete data set being the individuals included in the training subset distributed onto a new training set and onto a new testing set each one having about the half of the records of the original optimized training set, while the originally optimized testing set is used as a third data subset for validation purposes. (**Lapointe,** ¶0154; 'About half of the records' of applicant is equivalent to '80%' of Lapointe. 'A third data subset' of applicant is '20% for testing' of Lapointe.)

Claim 7

Lapointe teaches in that the distribution of the data of the originally optimized training set onto the new training and new testing set is optimized by means of a pre-processing phase(**Lapointe,** ¶0148; 'Pre-processing phase' of applicant is equivalent to 'pre-process the western blot data' of Lapointe.) including the steps of said method for optimizing a database of sample records, said records being records in the originally optimized training set(**Lapointe,** ¶0099; Lapointe discloses optimizing a data set by deciding include or exclude a point from a given data set.)

Claim 8

Lapointe teaches in which the different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database, which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database data base comprising a certain number of known input variables and a certain number of known output variables. (**Lapointe,** ¶0184; Lapointe illustrates withholding a variable in training runs. If a variable is withheld, then a subset is generated.)

Claim 9

Lapointe does not teach defining a distribution of data from the complete data set onto a training data set and onto a testing data set.

Arouh teaches defining a distribution of data from the complete data set onto a training data set and onto a testing data set. (**Arouh,** ¶0229) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Lapointe by having both training and testing sets as taught by Arouh to define a distribution of data from the complete data set onto a training data set and onto a testing data set.

For the purpose of having separate training and testing sets ensures accurate results of the training.

Lapointe teaches generating a population of different prediction algorithm each one having a training and/or testing data set in which only some variables have been considered among all the original variables provided in the data sets, each one of the prediction algorithms being generated by means of a different selection of variables (**Lapointe,** ¶0066; Each 'prediction algorithm' of applicant is equivalent to each node of the neural network.); carrying out learning and testing of each prediction algorithm of the population and evaluating the fitness score of each prediction algorithm. (**Lapointe,** ¶0469; 'learning' of applicant is equivalent to 'reprocessed' of Lapointe.)

Lapointe does not teach applying an evolutionary algorithm to the population of prediction algorithms for achieving new generations of prediction algorithm.

Arouh teaches applying an evolutionary algorithm to the population of prediction algorithms for achieving new generations of prediction algorithm. (**Arouh,** abstract; 'Evolutionary algorithm' of applicant is equivalent to 'genetic algorithm' of Arouh. 'Prediction algorithms' of applicant is equivalent to 'neural networks' of Arouh.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Lapointe by using genetic algorithms to set the initial values of the neural network as taught by Arouh to applying an evolutionary algorithm to the population of prediction algorithms for achieving new generations of prediction algorithm.

For the purpose of using the random generation of values of the genetic algorithm to populate the neural network.

Lapointe teaches for each generation of new prediction algorithms representing each one a new different selection of input variable, the best prediction algorithm according to the best hypothesis of input variables selection is tested or validated (**Lapointe,** ¶0036; If a variable improves the results then it is selected for the next generation of the prediction algorithm.); a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performances and the minimum input variables are promoted for the processing of the new generations. (**Lapointe,** ¶0432)

Claim 10

Lapointe teaches the steps of said method for optimizing a database of sample records, for selecting the most predictive input variables. (**Lapointe,** ¶0099; 'Optimizing a database' of applicant is achieved by the 'greedy algorithm' of Lapointe.)10

Claim 11

Lapointe teaches in which different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database, which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables, and further comprising a pre-processing phase, including the steps of said method for optimizing a database of sample records, for selecting the most predictive input variables, characterized in that the database subjected to the a pre-processing phase of input variable selection is a training subset and a testing subset processed with said method. (**Lapointe,** ¶0099; 'Optimizing a database' of applicant is achieved by the 'greedy algorithm' of Lapointe. Lapointe illustrates excluding a point from a data set in order to optimize the data set. By excluding at least one data point, Lapointe is 'selecting the most predictive input variables.')

Claim 12

Lapointe teaches in that the complete database the distribution of the records of which has to be optimized has data records having a selected number of input variables, the selection being carried out with said method, and in which different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database. which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables. (**Lapointe,** ¶0099; 'Optimizing a database' of applicant is achieved by the 'greedy algorithm' of Lapointe. Lapointe illustrates excluding a point from a data set in order to optimize the data set.)

Claim 13

Lapointe teaches the pre-processing phases for optimizing the distribution of the records on a training subset and a testing subset and for selecting the most predictive input variables, is carried out alternatively one to the other several times. (**Lapointe,** ¶0158, ¶0160, Fig. 2; Lapointe illustrates the pre-processing phases goes through a number of optimizing methods in stages 'Y', 'AB' with 'AC' and 'AE'(see Fig. 2). The training of a subset of applicant is disclosed in Fig. 3 of Lapointe. In step 'Y' states to 'train networks on combined data.' Each network of the 'networks' is viewed as a subset that is trained.)

Claim 14

Lapointe teaches an average health value of the population is computed as a function of the fitness values of each single individual in the population (**Lapointe,** ¶0019; Lapointe invention is in regards to a woman's health.); coupling, recombination of genes and mutation of genes are carried out in a differentiated manner depending on the a comparison between the fitness of each individual of the couple and the average health value of the entire population to which the individuals belong (**Lapointe,** ¶0013 (for 'differentiated manner') and ¶0137; 'Recombination' and 'mutation' of applicant is equivalent to 'genetic algorithms' of Lapointe.); individuals having a fitness value lower or equal to the average health of the entire population are not excluded from the creation of new generations but are marked out and entered in a vulnerability list (**Lapointe,** ¶0430; Since applicant does not exclude the creation that is below a fitness value, this is equivalent to the contingency table of Lapointe. If the information is above a fitness level of applicant then it is on the contingency table of Lapointe. Below a given fitness value would be equivalent to 'vulnerability list.'); the number of subjects entered in the vulnerability list defining the number of possible marriages. (**Lapointe,** ¶0100; Since not all of the population is not involved with marriages then they (vulnerability list) 'defines' the number of possible marriages.)

Claim 21

Lapointe teaches in which the individuals are the different prediction algorithm representing a corresponding different initial random distribution of data records

onto the testing and the training data set and the genes consist in the binary status variable of association of each record to the training and to the testing subset. (**Lapointe,** ¶0066; 'Individuals' of applicant is equivalent to end 'nodes' of Lapointe.)

Claim 22

Lapointe teaches in which the individuals are the prediction algorithms each one representing a different training and testing data set, the difference residing in a different selection of input variables for each different training and testing subset, and the genes consist in the different selection variable which is provided for each input variable in the different training and testing subsets, the above mentioned selection variable being a parameter indicating the presence/absence of each corresponding input variable in the records of each data set. (**Lapointe,** ¶0007)

Claim 23

Lapointe teaches characterized in that it is in the form of a software program comprising instructions executable by a CPU, the software program being stored in a memory to which the CPU can access. (**Lapointe,** ¶0006; 'CPU' of applicant is equivalent to 'processor' of Lapointe.)

Claim 24

Lapointe teaches a software program stored on a memory device, the said software program consisting in the method according to claim 1 in the form of a executable instructions of a CPU or of a computer system. (**Lapointe,** ¶0006)

Claim 25

Lapointe teaches an apparatus or device for generating an action of response which is autonomously, i.e. by itself, chosen among a certain number of different kinds of actions of response stored in a memory of the apparatus or autonomously generated by the apparatus basing the said choice of the kind of action of response on the interpretation of data collected autonomously by means of one or more sensors responsive to physical entities or which are fed to the apparatus by means of input means, the said interpretation being made by means of a prediction algorithm in the form of a software saved in a memory of the said apparatus and being carried out by a central processing unit, characterized in that the apparatus being further provided with means for carrying out a training and testing phase of the prediction algorithm by inputting to the said prediction algorithm data of a known database in which input variables of the input data representing the physical entities able to being sensed by the apparatus through the one or more sensors and/or able to be fed to the apparatus by means of the input means are univoquely correlated to at least one definite kind of action of response among the different kinds of possible action of response, the said means for carrying out the training an testing being in the form of a training and testing software saved in a memory of the apparatus, the said training and testing being carried

out by means of a method according to claim 1, the said training and testing software program being the said method of training and testing in the form of' a software program or instructions. (**Lapointe,** ¶0006; 'Response which is autonomously' and all the sub functions listed by applicant id equivalent to 'data mining' of Lapointe.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 15, 16, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Lapointe and Arouh as set forth above in view of Boden. (U. S. Patent 5708774, referred to as **Boden**)

Claim 15

Lapointe and Arouh do not teach in which for coupling purposes and for generation of children at least one parent individuals must have a fitness value greater than the average health value of the population.

Boden teaches in which for coupling purposes and for generation of children at least one parent individuals must have a fitness value greater than the average health value of the population. (**Boden,** C6:6-15; 'Average health value' of applicant is equivalent to 'relative fitness' of Boden. Per Boden individuals with a low fitness value may not be selected. Thus, 'Couples with both members that are below the relative fitness level will not be selected.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe and Arouh by having an algorithm for selection as taught by Boden to have in which for coupling purposes and for generation of children at least one parent individuals must have a fitness value greater than the average health value of the population.

For the purpose of not selecting both pairs that are below the average health value.

Claim 16

Lapointe and Arouh do not teach in that each couple of individuals can generate individuals having a fitness different from the average health, so called offsprings if the fitness of one them, at least is greater than the average fitness, the offsprings of each marriage occupying the places of subjects entered in the vulnerability list and are marked out, so that a weak individual can continue to exist through his own children.

Boden teaches in that each couple of individuals can generate individuals having a fitness different from the average health, so called offsprings if the fitness of one them, at least is greater than the average fitness, the offsprings of each marriage

occupying the places of subjects entered in the vulnerability list and are marked out, so that a weak individual can continue to exist through his own children. (**Boden,** C6:6-15; If a parent is chosen to have a child then it is due to the fact is was a child which has a different fitness value than it's parents. If it did not then there would be no improvement within the algorithm.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe and Arouh by choosing one parent above and the second parent below the average health value as taught by Boden to have in that each couple of individuals can generate individuals having a fitness different from the average health, so called offsprings if the fitness of one them, at least is greater than the average fitness, the offsprings of each marriage occupying the places of subjects entered in the vulnerability list and are marked out, so that a weak individual can continue to exist through his own children.

For the purpose of allowing the weaker parent to generate offspring that might be above the average health value.

Claim 17

Lapointe and Arouh do not teach in that coupling between individuals having a very low fitness value and a very high fitness value are not allowed.

Boden teaches in that coupling between individuals having a very low fitness value and a very high fitness value are not allowed. (**Boden,** C6:6-15; "Low fitness value' are not chosen to have children.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of

Lapointe and Arouh by not allowing parents that are below the average health value to generate offspring as taught by Boden to have in that coupling between individuals having a very low fitness value and a very high fitness value are not allowed.

For the purpose of eliminating generations of offspring that will be below the average health value.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 18, 19, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Lapointe, Arouh and Boden as set forth above in view of Burke. ('A Genetic Algorithm Tutorial Tool for Numerical Function Optimisation', referred to as **Burke**)

Claim 18

Lapointe, Arouh and Boden do not teach in that the following recombination rules of the genes of the parents individuals coupled are considered in the case the parents individuals have not common genes.

Burke teaches in that the following recombination rules of the genes of the parents individuals coupled are considered in the case the parents individuals have not common genes. (**Burke,** p29, C2:10-20; 'Not have common genes' of applicant is controlled by Burke's 'Incest laws 0-3'.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe, Arouh and Boden by considering parents with genes not in common as taught by Burke to have in that the following recombination rules of the genes of the parents individuals coupled are considered in the case the parents individuals have not common genes.

For the purpose of starting with a broader domain of genes to avoid a local minimum.

Lapointe teaches the health of father and mother individuals are greater than the average health of the entire population; the crossover is a classical crossover according to which the genes of the father and of the mother individuals are substituted one with the other starting from a certain crossover point (**Lapointe,** ¶0100); the health of father and mother individuals are lower than the average health of the entire population; in this case the two children are formed through rejection of the parents genes they will receive by the crossover process. (**Lapointe,** ¶0034, 'Through rejection of the parents genes is equivalent to a 'sliding window' or an average of the variable.)

Lapointe and Arouh do not teach the health of one of the parents is less than the average health of the entire population while the health of the other parent is greater than the average health of the entire population; in this case only the parents whose health is greater than the average health of the entire population will transmit their genes, while the genes of the parent having an health lower than the average health of the entire population are rejected.

Boden teaches the health of one of the parents is less than the average health of the entire population while the health of the other parent is greater than the average health of the entire population; in this case only the parents whose health is greater than the average health of the entire population will transmit their genes, while the genes of the parent having an health lower than the average health of the entire population are rejected. (**Boden,** C6:6-15; Rejection of the parent which is below the average of applicant is equivalent to 'low fitness value may not be selected' of Boden.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe and Arouh by stating the rule where parents with below average health value will not pass on their genes as taught by Boden to have the health of one of the parents is less than the average health of the entire population while the health of the other parent is greater than the average health of the entire population; in this case only the parents whose health is greater than the average health of the entire population will transmit their genes, while the genes of the parent having an health lower than the average health of the entire population are rejected.

For the purpose of following the general guidelines of a genetic algorithm.

Claim 19

Lapointe teaches wherein each gene is characterised by a status level, the method further characterized in that genes rejection consists in modifying the status of the genes from one status level to a different status level. (**Lapointe,** ¶0034, the two status levels for genes are above average and below average. Lapointe uses a genetic algorithm which employs a threshold level such that a gene is either above of below the threshold level. As the genetic algorithm progresses, some genes status will change.)

Claim 20

Lapointe teaches in that a modified crossover of the genes of the parents individuals is carried out when the parents individuals has part of the genes that coincide, this modified crossover provides for generating and offspring in which the genes selected for crossover are the most effective ones of the parents. (**Lapointe,** ¶0100)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Lapointe and Arouh as set forth above in view of Rose. (U. S. Patent Publication 20020178132, referred to as **Rose**)

Claim 26

Lapointe and Arouh do not teach in that it is a system for sound or vocal recognition comprising input means responsive to acoustic waves, a processing unit connected to the input means responsive to acoustic waves, at least a memory in which a software program is stored the said program being in the form according to claims 23 or 24 and comprising coded instructions for enabling the processing unit to carry out a method according to claim 1, a further or the same above mentioned memory in which a dataset of known data records is stored or can be stored and/or input means for storing in the further or the said above mentioned memory a dataset of known data records.

Rose teaches in that it is a system for sound or vocal recognition comprising input means responsive to acoustic waves, a processing unit connected to the input means responsive to acoustic waves, at least a memory in which a software program is stored the said program being in the form according to claims 23 or 24 and comprising coded instructions for enabling the processing unit to carry out a method according to

claim 1, a further or the same above mentioned memory in which a dataset of known data records is stored or can be stored and/or input means for storing in the further or the said above mentioned memory a dataset of known data records. (**Rose,** ¶0015) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe and Arouh by having data be related to sound or acoustic waves as taught by Rose to have in that it is a system for sound or vocal recognition comprising input means responsive to acoustic waves, a processing unit connected to the input means responsive to acoustic waves, at least a memory in which a software program is stored the said program being in the form according to claims 23 or 24 and comprising coded instructions for enabling the processing unit to carry out a method according to claim 1, a further or the same above mentioned memory in which a dataset of known data records is stored or can be stored and/or input means for storing in the further or the said above mentioned memory a dataset of known data records.

For the purpose of utilizing the invention within a real world environment.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the

> subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 27, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Lapointe and Arouh as set forth above in view of Breed. (U. S. Patent Publication 20030002690, referred to as **Breed**)

Claim 27

Lapointe and Arouh do not teach in that it is a system for image recognition, the input means being responsible to electromagnetic waves, the system being able to recognize the shape of an object generating or reflecting electromagnetic waves, and/or the distance and/or the identity of the object.

Breed teaches in that it is a system for image recognition, the input means being responsible to electromagnetic waves, the system being able to recognize the shape of an object generating or reflecting electromagnetic waves, and/or the distance and/or the identity of the object. (**Breed,** abstract) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe and Arouh by using image data I the form of electromagnetic waves as taught by Breed to have in that it is a system for image recognition, the input means being responsible to electromagnetic waves, the system being able to recognize the shape of an object generating or reflecting electromagnetic waves, and/or the distance and/or the identity of the object.

For the purpose of implementing the invention for use for image recognition.

Claim 29

Lapointe teaches a specialized system for image pattern recognition having artificial intelligence utilities for analyzing a digitalized image (**Lapointe,** ¶0001 and ¶0148; 'Artificial intelligence' of applicant is equivalent to 'neural networks' of Lapointe.), i.e. an image in the form of a array of image data records, each image data record being related to a zone or point or unitary area or volume of a two or three dimensional visual image, so called pixel or voxel of a visual image (**Lapointe,** ¶0148; 'Pixel or voxel' of applicant is equivalent to 'Images are digitized' of Lapointe.), the said visual image being formed by an array of the said pixels or voxels and utilities for indicating for each image data record a certain quality among a plurality of known qualifies of the image data records (**Lapointe,** ¶0148; 'Array' of applicant is equivalent to 'fixed dimension' of Lapointe.); the system having a processing unit as for example a conventional computer, a memory in which an image pattern recognition algorithm is stored in the form of a software program which can be executed by the processing unit (**Lapointe,** ¶0006), a memory in which a certain number of predetermined different qualities which the image data records can assume has been stored and which qualities has to be univoquely associated to each of the image data records of an image data array fed to the system (**Lapointe,** ¶0006), input means for receiving arrays of digital image data records or input means for generating arrays of digital image data records from an existing image and a memory for storing the said digital image data array (**Lapointe,**

¶0006), output means for indicating for each image data record of the image data array a certain quality chosen by the processing unit in carrying out the image pattern recognition algorithm in the form of the said software program (**Lapointe,** ¶0006); the image pattern recognition algorithm is a prediction algorithm in the form of a software program, which prediction algorithm is further associated to a system being further provided with a training and testing software program (**Lapointe,** ¶0066, ¶0010), the system is able to carry out training and testing according to the method of of one or more of the preceding claims 1 to 22, the method is provided in the system in the form of the training and testing software program (**Lapointe,** ¶0010), a database being also provided in which data records are contained univoquely associating known image data records of known image data arrays with the corresponding known quality from a certain number of predetermined different qualities which the image data records can assume. (**Lapointe,** ¶0006, ¶0148)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negatived by the manner in which the invention was made.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Lapointe, Arouh and Breed as set forth above in view of Rose. (U. S. Patent Publication 20020178132, referred to as **Rose**)

Claim 28

Lapointe, Arouh and Breed do not teach in that the database of known data records comprises acoustic signals emitted by one or more objects or one or more living beings making part of the typical environment in which the device has to operate or the data relating to one or more images of one or more objects or one or more living beings making part of the typical environment in which the device has to operate to which are univoquely correlated to corresponding known kind, and/or identity and/or meaning of objects to which the said acoustic signals or image data are related and/or from which the said acoustic signals or image data are generated.

Rose teaches in that the database of known data records comprises acoustic signals emitted by one or more objects or one or more living beings making part of the typical environment in which the device has to operate or the data relating to one or more images of one or more objects or one or more living beings making part of the typical environment in which the device has to operate to which are univoquely correlated to corresponding known kind, and/or identity and/or meaning of objects to which the said acoustic signals or image data are related and/or from which the said

acoustic signals or image data are generated. (**Rose,** ¶0004) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe, Arouh and Breed by using signals to detect living beings as taught by Rose to have in that the database of known data records comprises acoustic signals emitted by one or more objects or one or more living beings making part of the typical environment in which the device has to operate or the data relating to one or more images of one or more objects or one or more living beings making part of the typical environment in which the device has to operate to which are univoquely correlated to corresponding known kind, and/or identity and/or meaning of objects to which the said acoustic signals or image data are related and/or from which the said acoustic signals or image data are generated.

For the purpose of detecting living beings to aid in rendering a decision to an environment.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

> Patentability shall not be negatived by the manner in which the invention was made.

Claims 30-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Lapointe and Arouh as set forth above in view of Kwok. (U. S. Patent 6177249, referred to as **Kwok**)

Claim 30

Lapointe and Arouh do not teach for producing a microarray for genotyping operations, the said method comprising the steps of defining a certain number of theoretically relevant genes or alleles or polymorphisms considered relevant for a certain biologic condition like a tissue structure, a pathology or the potentiality of developing a pathology or an anatomic or morphologic feature.

Kwok teaches for producing a microarray for genotyping operations (**Kwok,** abstract), the said method comprising the steps of defining a certain number of theoretically relevant genes or alleles or polymorphisms considered relevant for a certain biologic condition like a tissue structure, a pathology or the potentiality of developing a pathology or an anatomic or morphologic feature. (**Kwok,** C4:19-32) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe and Arouh by producing information concerning genes and alleles as taught by Rose to have for producing a microarray for genotyping operations, the said method comprising the steps of defining a certain number of theoretically relevant genes or alleles or polymorphisms

considered relevant for a certain biologic condition like a tissue structure, a pathology or the potentiality of developing a pathology or an anatomic or morphologic feature.

For the purpose of determining tissue structure, pathology or anatomic feature.

Lapointe does not teach a) providing a database of experimentally determined data in which each record relates to a known clinical or experimental case of a sample population of cases and which records comprise a certain number of input variables corresponding to the presence/absence of a certain predetermined number of polymorphisms and/or mutations and/or equivalent genes of a certain number of theoretically probable relevant genes, said certain predetermined number of polymorphisms and/or genes forming a set, and one or more related output variables corresponding to the certain biological or pathologic condition of the said clinical and experimental cases of the sample population.

Arouh teaches a) providing a database of experimentally determined data in which each record relates to a known clinical or experimental case of a sample population of cases and which records comprise a certain number of input variables corresponding to the presence/absence of a certain predetermined number of polymorphisms and/or mutations and/or equivalent genes of a certain number of theoretically probable relevant genes, said certain predetermined number of polymorphisms and/or genes forming a set, and one or more related output variables corresponding to the certain biological or pathologic condition of the said clinical and experimental cases of the sample population. (**Arouh,** ¶0008; 'Providing a database...clinical or experimental...present/absent...of polymorphisms ...mutations

...equivalent genes...said certain predetermined numberof polymorphisms and/or genes forming a set' of applicant is equivalent to 'identifying the alleles and /or single nucleotide. Polymorphism (SNP) patterns relevant in a practical sense to diseases' of Arouh.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Lapointe by having a database of information pertaining to genes and their possible composite functions as taught by Arouh to have providing a database of experimentally determined data in which each record relates to a known clinical or experimental case of a sample population of cases and which records comprise a certain number of input variables corresponding to the presence/absence of a certain predetermined number of polymorphisms and/or mutations and/or equivalent genes of a certain number of theoretically probable relevant genes, said certain predetermined number of polymorphisms and/or genes forming a set, and one or more related output variables corresponding to the certain biological or pathologic condition of the said clinical and experimental cases of the sample population.

For the purpose to have access to the basic working elements of genes and their possible functions to identify pathologic functions.

Lapointe teaches characterized by the following further steps:
determining a selection of a subset of the set of certain predetermined number of polymorphisms and/or genes by testing the association of the said genes or polymorphisms and the biological or pathological condition by means of mathematical tools applied to the database (**Lapointe,** ¶0184; Lapointe illustrates withholding a

variable in training runs. If a variable is withheld, then the set becomes a subset.); the said mathematical tools comprise a so called prediction algorithm such as a so called neural network (**Lapointe,** ¶0468); and the further steps are carried out of: dividing the database into a training and a testing dataset for training and testing the prediction algorithm (**Lapointe,** ¶0007); defining two or more different training datasets each one having records with a set of input variables obtained by excluding one or more input variables from the originally defined number of input variables. while for each record the set of input variables of the corresponding training set has at least one input variable which is not a member of the set of input variables of the other training datasets, each said at least one input variable consisting in a different gene or a different polymorphisms and/or a different mutation and/or a different functionally equivalent gene thereof of the originally considered genes or polymorphisms and/or mutations and/or functionally equivalent genes thereof considered theoretically potentially relevant for the biologic or pathologic condition(**Lapointe,** ¶0503; Lapointe illustrates having two sets of variables for 'endometriosis'.); training the prediction algorithm with each of the different training sets defined under point e) for generating a first population of different prediction algorithm which are divided into two groups of mother and father prediction algorithms and testing the said prediction algorithms with the associated testing set(**Lapointe,** ¶0007); calculating a fitness score or prediction accuracy of each father and mother prediction algorithms of the said first population by means of the testing results. (**Lapointe,** ¶0468; 'Fitness score' of applicant s equivalent to 'output' of Lapointe.)

Lapointe does not teach i) providing a so called evolutionary algorithm such a genetic algorithm and applying the evolutionary algorithm to the first population of mother and father prediction algorithms for achieving new generation of prediction algorithms whose training and testing dataset comprises records whose input variables selections are a combination of the input variable selections of the records of the training and of the testing datasets of the first or previous population of father and mother prediction algorithms according to the rules of the evolutionary algorithm.

Arouh teaches i) providing a so called evolutionary algorithm such a genetic algorithm and applying the evolutionary algorithm to the first population of mother and father prediction algorithms for achieving new generation of prediction algorithms whose training and testing dataset comprises records whose input variables selections are a combination of the input variable selections of the records of the training and of the testing datasets of the first or previous population of father and mother prediction algorithms according to the rules of the evolutionary algorithm. (**Arouh,** abstract; 'Evolution algorithms' of applicant is equivalent to the algorithm that 'genetic algorithm' by Arouh.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Lapointe by using a genetric algorithm to train anneural network as taught by Arouh to have i) providing a so called evolutionary algorithm such a genetic algorithm and applying the evolutionary algorithm to the first population of mother and father prediction algorithms for achieving new generation of prediction algorithms whose training and testing dataset comprises records whose input variables selections are a combination of the input variable

selections of the records of the training and of the testing datasets of the first or previous population of father and mother prediction algorithms according to the rules of the evolutionary algorithm.

For the purpose of implementing selection rules which are determined by the genetic algorithm and implementing those rules on the neural network.

Lapointe teaches for each generation of new prediction algorithms representing each new variant selection of input variables, the best prediction algorithm according to the best hypothesis of input variable selection is tested or validated by means of the testing dataset (**Lapointe,** ¶0036; If a variable improves the results then it is selected for the next generation of the prediction algorithm.); a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performance with the minimum number of input variables utilized are promoted for the processing of new generations (**Lapointe,** ¶0468); repeating the steps i) to k) until a predetermined fitness score defined as best fit of the prediction algorithm and a minimum number of input variables has been reached. (**Lapointe,** ¶0526; Lapointe, demonstrates a repeating iteration for 'evaluation')

Lapointe and Arouh do not teach m) defining as the selected relevant input variables i.e. as the relevant genes or polymorphisms and/or of mutations and/or of functionally equivalent genes thereof the ones related to the input variables of the selection represented by the prediction algorithm having both at least the predetermined fitness score and also the minimum number of selected input variables.

Kwok teaches m) defining as the selected relevant input variables i.e. as the relevant genes or polymorphisms and/or of mutations and/or of functionally equivalent genes thereof the ones related to the input variables of the selection represented by the prediction algorithm having both at least the predetermined fitness score and also the minimum number of selected input variables. (**Kwok,** C4:19-32) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Lapointe and Arouh by determining which relevant genes are to be used as input variables as taught by Kwok to have m) defining as the selected relevant input variables i.e. as the relevant genes or polymorphisms and/or of mutations and/or of functionally equivalent genes thereof the ones related to the input variables of the selection represented by the prediction algorithm having both at least the predetermined fitness score and also the minimum number of selected input variables.

For the purpose of being able to predict mutations or functional equivalent genes.

Claim 31

Lapointe teaches an optimization of the distribution of the records of the original database in a training dataset and in a testing dataset is carried out in one of a pre processing and a post processing phase, i.e. before carrying out the steps e) to m) at step d) or after having carried out the steps a) to m) (**Lapointe,** ¶0007 and ¶0010)

Claim 32

Lapointe teaches defining a set of one or more distributions of the database records onto respective training and testing subsets (**Lapointe,** ¶0091);- using the defined set of distributions to train and test a first generation set of one or more prediction algorithms and assigning a fitness score to each(**Lapointe,** ¶0091); - feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each (**Lapointe,** ¶0066 and ¶0468; Each 'prediction algorithm' of applicant is equivalent to each node of the neural network. 'Fitness score' of applicant s equivalent to 'output' of Lapointe.); and continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs (**Lapointe,** ¶0469; 'Termination' of applicant occurs when the 'desired output would fall in the range of 0.0 to 1.0' of Lapointe.); where said termination event is at least one of a prediction algorithm is generated with a fitness score equaling or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction algorithms converging to a given value, and a certain number of generations having been generated. (**Lapointe,** ¶0469; 'Termination' of applicant occurs when the 'desired output would fall in the range of 0.0 to 1.0' of Lapointe.)

Claim 33.

Lapointe teaches generating a population of prediction algorithm each one of them is trained and tested according to a different distribution of the records of the data set in the complete database onto a training data set and a testing data set (**Lapointe,** ¶0066 and

¶0468; Each 'prediction algorithm' of applicant is equivalent to each node of the neural network. 'Fitness score' of applicant s equivalent to 'output' of Lapointe.); each different distribution being created by a random or pseudo-random distribution (**Lapointe,** ¶0141); - each prediction algorithm of the said population is trained according to its own distribution of records of the training set and is validated in a blind way according its own distribution on the testing set (**Lapointe,** ¶0468); - a score reached by each prediction algorithm is calculated in the testing phase representing its fitness; - an evolutionary algorithm being further provided which combines the different models of distribution of the records of the complete data set in a training and in a testing set which sets are represented each one by a corresponding prediction algorithm trained and tested on the basis of the said training and testing data set according to the fitness score calculated in the previous step for the corresponding prediction algorithm (**Lapointe,** ¶0469); - the fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets (**Lapointe,** ¶0066; 'Score' of applicant is equivalent to 'output' of Lapointe.); - Repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a desired value (**Lapointe,** ¶0125 and formula between ¶0125 and ¶0126; 'Finite number of generations' of applicant is illustrated by the values of the double summation symbols, '10' and 's' of Lapointe.);

setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm. (**Lapointe,** ¶0125 and formula between ¶0125 and ¶0126; 'Best solutions' of applicant is illustrated by the values of the double summation symbols, '10' and 's' of Lapointe.)

Claim 34

Lapointe teaches a reduced number of genes, alleles or polymorphisms characterized in that the reduced number of the said genes, alleles or polymorphisms has been selected by means of a method according to claims 30 to 33. (**Lapointe,** ¶0184; 'Genes' of applicant is equivalent to 'variables' of Lapointe.)

Response to Arguments

5. Applicant's arguments filed on December 5, 2006 for claims 1-34 have been fully considered but are not persuasive.

6. In reference to the Applicant's argument:

Claims 1-34 are now presented for examination. Claims 1, 2, 7-15, 19, 30 and 31 have been amended to more particularly point out and distinctly claim the subject matter regarded as the invention. Claims I and 30 are independent. Favorable review is respectfully requested.

Claims 4-7 10-14, 16-18, 20-23, 25-29 and 31-34 were objected to under 37 C.F.R. § 1.75(c) as being in improper form. The claims have been carefully reviewed and revised where appropriate to ensure that correct dependence of the claims is recited. Claim 1, directed to a method for performing a supervised learning process, is independent; claims 2-29 depend directly or indirectly therefrom. Claim 30, directed to a method for producing a microarray for genotyping operations, is also independent; claims 31-34 are dependent therefrom, with claim 34 directed to the microarray and reciting all the features of method claim 30.

Claims 1-29 were rejected under 35 U.S.C. § 101 as reciting non-statutory subject matter. The Examiner stated that the invention was not limited to a substantial practical application, and in particular that optimizing a database (as recited in the claims) was an exercise only, without practical application. Independent claim 1 has been carefully reviewed and revised in light of the Examiner's comments. The claim has been amended to explicitly recite: (1) how the invention is employed, namely in a supervised learning process; (2) the application of the result, namely applying a selected prediction algorithm to a predetermined problem; and (3) where and how the method is implemented, namely with a computer and computer software forming an intelligent system. This revised claim language is clearly supported in the specification at paragraphs 83-90, particularly paragraph 90. It is respectfully submitted that amended claim 1, along with claims 2-29 dependent therefrom, recites statutory subject matter.

Examiner's response:

The amended claims still remain rejected under 35 U.S.C. §101 due to the fact that no practical application has not been disclosed. The Examiner has attempted to enlighten what is needed to overcome this rejection. The amended claims are in the right direction but still fall short of what is needed. 'Performing a supervised learning process in an artificial intelligence environment including optimizing a database of sample records for the training and testing of a prediction algorithm' still remains within the confines of the computer and thus no practical application has been stated. Another way of seeing this if there exists two separate databases of sample records for training. One set is 'optimized' while the other is 'normal'. Is there a practical

application of using the 'optimized' dataset over the 'normal' databases? Concluding with is this 'practical application' supported within the specification? Office Action stands.

7. In reference to the Applicant's argument:

Claim 8 was rejected under 35 U.S.C. § 112, first paragraph. The Examiner stated that the phrase "structure of the training" rendered the claim non-enabling. The claim has been revised to recite --the structure of the training subset and the structure of the testing subset--, referring to subsets of the set of distributions of database records as recited in claim 1. Claim 8, as amended, is therefore believed to be in compliance with 35 U.S.C. § 112.

Examiner's response:

Examiner withdraws the rejection.

8. In reference to the Applicant's argument:

Claim 9 was rejected under 35 U.S.C. § 112, first paragraph. The Examiner stated that the recitation of numbers and selection of variables rendered the claim non-enabling; in particular, the Examiner stated that the claim introduced two independent domains of variables without a methodology for solving for those variables. The applicant wishes to point out that claim 8, from which claim 9 depends, recites that the database records include a certain number of known input variables and a certain number of known output variables. Claim 9 goes on to recite a population of prediction algorithms each having a data set in which not all of the variables are selected; some are left out (see specification, paragraph 105). This means that with respect to certain algorithms and data sets, some input data will not be required (see specification, paragraph 109). In other words, different algorithms will call for different input variables and thus different types of input data. Claim 9 recites generation of algorithms with different training and testing data sets, in which the selection of inputs varies accordingly, as opposed to requiring a methodology for solving for variables. It is believed that claim 9 as presented is in compliance with 35 U.S.C. § 112.

Examiner's response:

Examiner withdraws the rejection.

9. In reference to the Applicant's argument:

Claim 19 was rejected under 35 U.S.C. § 112, second paragraph. The Examiner stated that the phrase "one to a following status level defined for the genes" rendered the claim indefinite. The claim has been revised to recite that the status level of a gene is modified from one status level to another status level. It is believed that claim 19 as amended is in compliance with 35 U.S.C. § 112.

Examiner's response:

Examiner withdraws the rejection.

10. In reference to the Applicant's argument:

Claim 30 was rejected under 35 U.S.C. § 112, second paragraph. The Examiner stated that the terms "reduced number" and "microarray" rendered the claim indefinite. The claim has been revised to avoid the phrase "reduced number." The amended claim recites --a subset of the set of certain predetermined number--. With regard to the term "microarray," the applicant respectfully submits that this is a term known in the art, as evidenced by the discussion in paragraphs 135-148 of the specification. In particular, a cited reference "DNA microarrays in medical practice" includes the term in its title (paragraph 139). Accordingly, it is believed that claim 30 as amended is in compliance with 35 U.S.C. § 112.

Examiner's response:

Examiner withdraws the rejection.

11. In reference to the Applicant's argument:

Claim 2 was rejected under 35 U.S.C. § 112, second paragraph. The Examiner stated that the term "pseudo-random" rendered the claim indefinite, as this term was not clearly defined or an accepted term in the art. This statement is respectfully traversed. The term "pseudo-random" is well known in mathematics and statistics as referring to a distribution constructed using a deterministic process (e.g. a mathematical algorithm, executed by a program running on a standard digital computer), as opposed to a distribution constructed using a classical non-deterministic process (e.g. a physical process such as rolling dice). Indeed, the distinction between "random" and "pseudo-random" has critical implications for some important applications such as cryptography (see Luby, Pseudorandomness and Cryptographic Applications., Princeton University Press, 1996). Formal definitions of a pseudo-random distribution may readily be found through wikipedia.org and planetmath.org. Accordingly, it is submitted that claim 2, as presented herein, is in compliance with 35 U.S.C. 112

Examiner's response:

Per Winipedia.org. 'A pseudorandom process is a process that appears random but is not. Pseudorandom sequences typically exhibit statistical randomness while being generated by an entirely deterministic causal process.' Thus it is determined by some process or function but the claim does not state which process or function is used and thus 'indefinite.' Office Action stands.

12. In reference to the Applicant's argument:

Claim 15 was rejected under 35 U.S.C. § 112, second paragraph. The Examiner stated that the term "close to the average health value" rendered the claim indefinite. The claim has been revised to recite --greater than the average

health value--. It therefore is believed that claim 15 as amended is in compliance with 35 U.S.C. § 112.

Examiner's response:

Examiner withdraws the rejection.

13. In reference to the Applicant's argument:

Claims 1, 2, 3, 8, 9, 19 and 24 were rejected under 35 U.S.C. § 102(e) as being anticipated by Lapointe et al. (U.S. Patent Application Publication 2003/0004906). The applicant respectfully submits that amended claim 1 is patentably distinct from the cited art, for the following reasons.

The present invention, as defined in claim 1, is directed to a method including the step of' defining one or more distributions of database records onto respective training and testing subsets; using this defined set to train and test a first generation set of prediction algorithms; and feeding those prediction algorithms to an evolutionary algorithm which generates a set of second generation algorithms. In addition, claim 1 recites that a fitness score is assigned to each generated prediction algorithm.

Lapointe et al. is understood to disclose a method in which a set of data is partitioned into training and testing files (paragraph 91). Training of the neural networks is performed using the training partitions, and the networks are then evaluated using the testing partition (paragraph 141). Test set performance is maximized empirically, and test networks are trained with training parameters chosen empirically (paragraph 142).

Lapointe et al. therefore teaches a method of training by partitioning (see paragraph 92). Lapointe et al. does not mention generations of prediction algorithms (or generations of networks). and is not understood to disclose or suggest an evolutionary algorithm as recited in claim 1. In the passage cited by the Examiner (Lapointe et al. paragraph 468), a set of data (based on actual observations of patients) was constructed for use as a training example. Lapointe et al. briefly discusses the methodology used in the example, and states that some data points in the patient history data set were constructed because for some patients the actual data was missing. This procedure is understood to be a preliminary step of making the particular data set usable for the purpose of training a network. The process of

supplying substitutes for missing data points is not understood to be relevant to generating prediction algorithms, or using an evolutionary algorithm to generate a set of second generation algorithms, as in the present invention.

Lapointe et al. is also not understood to disclose assigning a fitness score to an algorithm, as required by claim 1. Lapointe et al. teaches producing a `consensus network' having an averaged performance estimate (paragraph 141). Lapointe et al. offers no other teaching regarding the performance (fitness, or any other quality) of a given individual network. Lapointe et al. therefore does not disclose or suggest an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each; or using a fitness score as a criterion for a termination event in an evolutionary process.

Since Lapointe et al. does not disclose or suggest the features of claim I noted above, the invention defined in claim 1 is not anticipated by that reference.

Examiner's response:

Arouh discloses using a genetic algorithm (evolution algorithm) to train a neural network (prediction algorithm).(**Arouh,** abstract) 'Fitness score' of applicant is equivalent to 'ranking' of Lapointe. (**Lapointe,** ¶0033)

14. In reference to the Applicant's argument:

Claim 15, indirectly dependent from claim 1, was rejected under 35 U.S.C. § 103(a) as being unpatentable over Lapointe et al. in view of Boden (U.S. Pat. No. 5,708,774). The applicant respectfully submits that amended claim 15 is patentable over the cited art, for the following reasons.

Claim 15 directly depends from claim 14 and incorporates all of the features of claim 14. Claim 15 thus characterizes the evolutionary algorithm as a genetic algorithm with certain evolutionary rules. One of these rules is that individuals having a fitness value lower or equal to the average health of the entire population are not excluded from the creation of new generations but are marked out and entered in a vulnerability list.

As noted above, Lapointe et al. does not suggest using an evolutionary algorithm (whether or not characterized as a genetic algorithm), and in particular does not

suggest a fitness function used with an evolutionary algorithm. Furthermore, since it is concerned with a `consensus network' with an averaged performance estimate, Lapointe et al. does not suggest the desirability of assigning a fitness value to an algorithm, let alone using that fitness value as a criterion in an evolutionary algorithm. Lapointe et al. thus does not provide motivation for a combination with Boden regarding a fitness value. MPEP § 2143.01.

Boden is understood to disclose automated testing software including a "fitness function" for evaluating individual call sequences (col. 5, line 66, to col. 6, line 15). Boden teaches (col. 6, lines 8-15) that succeeding generations are chosen based on the fitness function, and states that "individuals of low fitness value may not be selected at all." Boden therefore does not teach or suggest that individuals having a fitness value lower or equal to the average health of the entire population are marked out and entered in a vulnerability list, as required by claim 15.

A combination of Lapointe et al. and Boden would at best yield an evaluation scheme in which a fitness function is executed, and individuals with a below-average fitness evaluation would not be selected for the next generation. Neither of the cited references, nor a combination thereof, suggests that individuals having a fitness value lower or equal to the average health of the entire population be not excluded from the creation of new generations but rather marked out and entered in a vulnerability list. Accordingly, claim 15 would not have been obvious from either of the references, or from a combination thereof.

Examiner's response:

Arouh discloses using a genetic algorithm (evolution algorithm) to train a neural network (prediction algorithm).(**Arouh,** abstract) 'Fitness function' of applicant is equivalent to 'fitness value' of Boden. Boden is used in conjunction with Lapointe and Arouh which do teach using a genetic algorithm to train a neural network. Arouh and Boden both have genetic algorithms in common thus disclosing the motivation to combine these two references. Applicant's 'fitness value' that is related to the 'average' is disclosed in Boden. The 'average fitness function' of applicant is equivalent to 'relative fitness' of Boden. Applicant states that Boden does not teach 'having a fitness value lower or equal to the average health of the entire population are marked out

and entered in a vulnerability list' is equivalent to 'those individuals of low fitness value may not be selected at all.' Thus resulting the 'vulnerability list' of applicant is all those which fall within the 'low fitness value' of Boden.

15. In reference to the Applicant's argument:

Claim 30 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Lapointe et al. in view of Kwok et al. (U.S. Pat. No. 6,177,429). The applicant respectfully submits that amended claim 15 is patentable over the cited art, for the following reasons.

Claim 30 is directed to a method for producing a microarray for genotyping operations, including the steps of providing a database of experimentally determined data; dividing the database into a training and a testing dataset for training and testing a prediction algorithm; defining two or more different training datasets; training and testing the prediction algorithm with each of the different training sets and the associated testing set; calculating a fitness score or prediction accuracy of each algorithm; and providing an evolutionary algorithm. As discussed above, Lapointe et al. does not disclose or suggest calculating a fitness score or prediction accuracy, and does not provide an evolutionary algorithm as recited in claim 30. Kwok et al. is understood to disclose a method of detecting a nucleotide or sequence of nucleotides; Kwok et al. does not disclose or suggest defining datasets, training and testing prediction algorithms, or providing an evolutionary algorithm. In particular, Kwok et al. does not suggest calculating a fitness score as recited in claim 30. Furthermore, Kwok et al. does not suggest repeatedly applying an evolutionary algorithm until a predetermined fitness score has been reached. It follows that Kwok et al. cannot remedy the above-noted defects of Lapointe et al. as a reference against the invention defined in claim 30. The features of claim 30 described just above would not have been obvious from either of the references, or from a combination of them.

The other claims in this application are dependent from one or the other of the independent claims discussed above and are believed to be patentable for the same reasons. Since each dependent claim is deemed to define an additional aspect of the invention, however, the consideration of each claim on its merits is respectfully requested.

In view of the foregoing amendments and remarks, favorable consideration and early passage to issue of the application are respectfully requested.

Examiner's response:

'Fitness score' of applicant s equivalent to 'output' of Lapointe. (**Lapointe,** ¶0468) 'Prediction algorithms' of applicant is equivalent to 'neural networks' of Lapointe. (**Lapointe,** ¶0005) Training and testing algorithms are disclosed by Arouh. (**Arouh,** ¶0229) 'Evolutionary algorithm' of applicant is equivalent to 'genetic algorithms' of Lapointe. (**Lapointe,** ¶0100) Suggesting, 'repeatedly applying an evolutionary algorithm until a predetermined fitness score has been reached' might not be possible. It is based on the assumption that an optimum value can be reached in enough iteration are performed. This is just not the case. It might be the case that a local optimum will fall below a given threshold. The best outcome for an 'evolutionary algorithm' would be If a variable improves the results then it is selected for the next generation of the prediction algorithm. (**Lapointe,** ¶0036;)

Examination Considerations

16. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ

541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has the full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

17. Examiner's Notes are provided to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and sprit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but link to prior art that one of ordinary skill in the art would find inherently appropriate.

18. Examiner's Opinion: Paragraphs 16 and 17 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

19. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

20. Claims 1-34 are rejected.

Correspondence Information

21. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 272-3150 (for formal communications intended for entry.)

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Peter Coughlan

1/21/2007

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